Frankly Speaking

On Membership Qualifications

OUR INSTITUTE will serve well through the years accordingly as its quality of membership is kept high. But high quality of membership requires more than just high standards of admission. Those standards must be practicable and must be adhered to intelligently.

During earlier Institute history the problem frequently was one of determining first whether an applicant was a qualified traffic engineer or just another one of the horde of pseudo traffic experts who had never heard of an engineering principle or of professional responsibility. The pseudo experts gradually are being shoved aside by more qualified men.

Membership standards have been revised during recent years in three ways. The Board has become increasingly strict in making interpretations, the definition of Traffic Engineering has been broadened and the Affiliate classification has been strengthened. Also, for clarification, definitions of certain terms used in connection with membership requirements soon will be adopted.

All Institute members should take more responsibility in this problem of selecting new members. They should be alert for good prospects, but avoid encouraging unqualified persons to apply just because they are close friends or "good fellows". Members should be loyal to the Institute when used as a reference by being frank and by making an effort to find out and present the *true facts* about the candidate, without overstatement or understatement.

Prospective members should think of associating themselves with the Institute, not for what the Institute will do for them personally and professionally, but instead, what they can do for the Institute. This is especially applicable to those in allied fields, who might be interested in Affiliate Membership in the Institute.

For the use of those who may be interested in applying for membership, as well as a general reference for all members, there has been included in the latter pages of this issue of the magazine the qualifications for membership in the Institute of Traffic Engineers.

Virden A Rathgeb

Chairman, Membership Committee

VOLUME XV MAY, 1944 NUMBER 8

How Good is Your Traffic Sample?

by HENRY K. EVANS

In the postwar era, attention will be focused on the need for new traffic data. As traffic volumes, accidents, and congestion begin to rise rapidly, traffic authorities will meet the new problems with solutions based on sound engineering studies. In measuring the effects of such solutions, greater attention will be focused on comparing "after" studies with "before" studies. After the war, the traffic engineer will be vitally interested in the new trends of traffic, which will mean making periodic measurements of traffic characteristics.

In all of this increased activity in the field of traffic measurements, the theory and technique of sampling will play an important part. For many years traffic engineers have been giving increasing recognition to the advantages of using the sampling method in securing traffic data. They have found that a one-hour volume survey will yield information which, when handled in the right way, will give an estimated eight-hour volume figure within a couple of per cent of what would have been found by an actual 8-hour count. They have found that it is not necessary to make an all-day driver obedience study, but that a short sample study will yield results of sufficient accuracy. In speed studies, cordon counts, origin and destination surveys, and all other traffic measurements involving large volumes of data, the use of the sampling technique can and should be used to its fullest advantage. Thousands of man-hours of work may be saved thereby. The time saved may then be put into obtaining other related data of advantage to the traffic engineer.

For instance, instead of making an 8-hour, 100% accurate volume count at a high accident frequency intersection under study, the time might be better spent in making a 2-hour, 90% accurate volume count, plus a 2-hour approach speed study and a 1-hour obedience study, leaving 3 hours for much needed work elsewhere.

The purposes of this article are (1) to point out that traffic engineers do not need to deal with large numbers and extensive data to measure traffic characteristics, but that short sample studies are just as valuable, and (2) to show the method of estimating the probable amount of error in a sample study average.

The Average of a Sample

When traffic engineers make sample measurements of automobile speeds, volumes, occupancy, and other characteristics, the results, as tabulated, consist of a number of different values. Then, in order to put a "handle" onto the data, a single value is picked from the array to represent the data. This representative value is usually the one which is the most popular in the array, as evidenced by the tendency of the other numbers to group around it. This representative value, or "average", is generally computed

An original article by Henry K. Evans, (Assoc.) Traffic Engineer, Traffic and Transportation Division, National Conservation Bureau, New York, 7, N. Y.

as the mean (the arithmetic average), the median, or the mode, all three of which may differ slightly, depending on the distribution of the array, but all three of which are valid statements of the "central tendency" of the group of values.

This average value then is generally taken not only to represent the sample of traffic observations, but also to represent the entire population of values from which the sample was taken. Thus if a speed check of 130 observations on a street showed an average of 17.3 miles per hour (some traffic engineers prefer to use as the average, the 85-percentile, i.e. that speed at which and below which 85% of the motorists traveled), this average would be taken to represent the average speed of *all* vehicles on the streets the time the count was being made.

But does it?

Accuracy of a Sample

The accuracy of the sample depends on two things. One is pure chance. The smaller the number of observations the greater are the chances that the values picked will give an average different from the true average. This probable amount of error in the average of any sample can be estimated, based on the law of probability. The calculation of this estimate is discussed later.

The other factor affecting the value of the sample is the method of sampling. *The sample represents only the population from which it was drawn.* In a speed study, if only the fastest speeds were recorded, the average would be representative of the faster element of traffic on that street. To get a true cross-section of speeds, in a spot speed check, the traffic engineer generally selects the speeds at random, by observing every 10th car for instance.

In any kind of questionnaire study, the returned questionnaires represent only the characteristics of the people who returned them, not necessarily the people to whom the questionnaires were first submitted. It might be true that the people who were enough interested and cooperative to fill in and return the questionnaires, had certain characteristics which set them apart from the general run of people to whom were submitted the questionnaires in the first place. Common sense must tell the traffic engineer what particular population his sample represents. The requirements for a representative sample can be summed up into:

1. The sample must be selected without bias.
2. The components of the sample must be completely independent of one another.
3. There should be no underlying differences between areas from which the data are selected.
4. Conditions must be the same for all items constituting the sample.

Measuring the Reliability of the Sample

Assuming that the sample has been chosen in an unbiased manner, it is then possible to calculate the degree of error that has crept into the sample due to chance error in selection.

Perhaps this chance error may be illustrated by making an analogy to a customer in a cafeteria.

Let us say the diner wishes to get a balanced meal. First, in order to give him every chance to get an unbiased selection, we would set out for him a conglomeration of foods and drinks that, taken altogether, would be balanced. This corresponds to making the sample selection from an unbiased population of data.

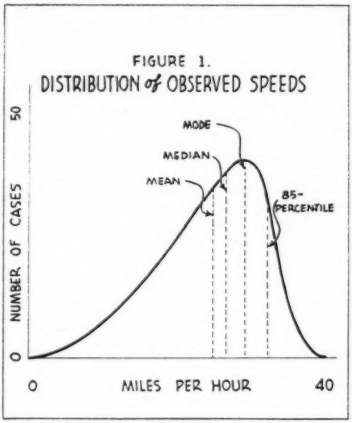
However, in passing down past the unbiased array of food, and taking dishes at random, there would be chances that the diner would not get foods in exactly the same proportion as were laid out on the serving counters. The smaller the number of dishes he takes, the greater the chances for difference between the composition of his meal and the true average had he taken a bite from each and every item of food and drink laid out.

This error is capable of measurement. But before taking up the actual calculation of error, let us discuss first the theory behind the sampling method that may give a clearer insight into the reasons why it is possible to calculate the error of a sample.

Let us assume that 10 teams of two men each are sent out, each team to get spot speed checks of 100 vehicles at each of 100 locations. If the 1000 studies were combined, the resulting table of 100,000 observed speeds would, if arranged into a frequency distribution, show a certain curve, probably like that shown in Figure 1. Generally speed curves are skewed to the left as shown.

But if the means (arithmetric averages) of the 1000 studies are combined into a frequency distribution, the resulting curve will approach a "normal" curve. This is because differences in the means of the 1000 individual samples arise only by chance. This normal curve, shown in Figure 2, is based on the law of probability. The mean of this distribution of 1000 means will be the same as or very near the true mean of the underlying data. By underlying data is meant the idealized distribution that would be made up by an infinite number of samples.

Looking at Figure 2, it is evident that some of the sample averages are quite a distance from the "true" mean. If the distance of the mean



furthest away can be obtained, the greatest possible error in sampling will be known.

Because this distribution follows a "normal" curve we know that 99.7% of the 1000 spot speed check averages would fall within 3 standard deviations (this term explained later) from the "true" mean. Then the biggest error that one of the speed-study crews could make would be equal to at most 3 standard deviations of this distribution of means. It is likely that a crew would find an average closer to the "true" mean, but to be on the safe side it is customary to use three standard deviations as the amount of error that could have crept into the average of a sample, at the very most.

To obtain the standard deviation of the distribution (Fig. 2) of sample means, only the data from one sample need be used. Therefore, if only one crew had gone out to one location, the data they brought back could be used. This is because the one sample, if chosen fairly and without bias, is a key to the entire population from which it was drawn, or to the whole cure in Figure 2.

Calculating the Error of a Sample

Now to actually calculate the amount of error that may have arisen in the sample, assuming that the sample was chosen fairly and at random.

Assume that we have a single spot speed check of 130 observations, tabulated as shown in Table A. The speeds shown in column (1) correspond to convenient intervals of time measured by a spot speed study crew at a speed trap.

TABLE A

(1) Speed in m.p.h. (X)	(2) Number of Observations (f)	(3) $f(X)^2$
30	1	900
27.2	2	1480
25.0	2	1250
23.0	4	2120
21.4	7	3206
20.0	15	6000
18.7	22	7693
17.6	16	4957
16.6	12	3307
15.7	11	2711
15.0	9	2025
14.2	7	1411
13.6	5	925
13.0	6	1014
12.5	3	469
11.5	2	264
11.1	3	370
10.7	1	115
10.3	0	0
10.0	1	100
9.6	1	92
	$130 = N$	$40{,}409 = \Sigma F(X)^2$

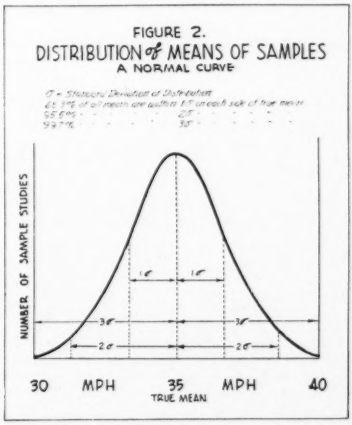
Average speed = 17.3 m.p.h.

The mean or average speed is found to be 17.3 m.p.h. Now it is possible to calculate the range of accuracy of this average, or to put a "plus or minus" after it to denote within what range the true mean would lie if it were possible to base it on a great number of observations.

Even if this sample is the total volume of cars passing the point during an hour, say, the "plus or minus" chance error will tell us within what range the true mean would lie if we could calculate it from similar studies at this location under similar conditions, made a great number of times. In other words, this error is the variation we may have encountered in the distribution of speeds and applies whether we measured 10% of the cars' speeds at one particular time or 100% of those cars' speeds.

However, as will be seen from the formula to be shown, the greater the number of cases in the study, the less will be the chance error.

But before going ahead with the calculation of the error in the average shown in Table A, let us define the term Standard Deviation. This is a measure of the "scatteration" of the individual values about the average value of the sample. The greater the deviation of the individual values away from the average, the greater will be the standard deviation. This standard deviation is computed by taking the quadratic mean of the deviations from the arithmetic mean of these values. The formula is shown on the next page, which has been simplified and expressed in terms of the individual values, the total number of them, and their average value.



Let: M = Average of all observations, in this case, 17.3 m.p.h.
D = Standard deviation of the sample
X = Value of a speed observation
f = Frequency of observation of one value
N = Number of observations in sample
E = Standard deviation of the means-or standard error

The standard deviation of the sample may be found from the formula:

$$D = \sqrt{\frac{\Sigma f (X^2)}{N} - M^2}$$

$$= \sqrt{\frac{40409}{130} - (17.3)^2} = 3.42 \text{ m.p.h.}$$

The standard error of the mean of the sample is calculated as follows:

$$E = \frac{D}{\sqrt{N}} = \frac{3.42}{\sqrt{130}} = 0.3 \text{ m.p.h.}$$

Since the standard error of the mean of the sample is numerically equal to the standard deviation of the means, and three standard deviations cover 99.7% of the means that might be found from a large number of samples, we can say that there are 99.7 chances out of 100 that the mean computed from this random sample will not be further away than three standard errors, or 0.9 m.p.h., from the true average speed.

For all practical purposes, the error can be stated as 2 standard errors, or 0.6 m.p.h., which would include 95.5% of all cases; meaning that there are only 4.5 chances in 100 that the average would be any further away than ± 2 standard errors from the "true" mean.

Thus the average speed may be expressed as 17.3 ± 0.6 m.p.h. If other similar sample studies were made, there would be 95.5 chances out of 100 that the average speed would fall between 16.7 and 17.9 m.p.h.

This then is the measure of accuracy of the sample, assuming that the selection was at random, and unbiased. This type of analysis is useful in judging how far one may go in making comparisons. It should prevent drawing conclusions or comparisons not justified by the number of observations, and hence prove useful as a check on sample traffic studies.

PLAN NOW TO ATTEND I.T.E. ANNUAL MEETING

CHICAGO - OCTOBER 1, 2, 3, 4

Special Notice on Hotel I.T.E. Headquarters and Room Reservation Blanks now being sent to all Institute Members by Secretary Wilbur Smith.

What About Fluorescent Street Lighting?

by KIRK M. REID

THE question has been raised in many quarters as to whether fluorescent lamps will not play an increasingly important role in street lighting after the war. These questions reflect the widespread popular interest in fluorescent lighting.

Studies of the application of flourescent sources to street lighting have been in progress for several years in the General Electric Company and elsewhere. Extensive tests have been made at Nela Park on both hot-cathode fluorescent lamps and cold-cathode high-voltage fluorescent tubes operated in series and in multiple under outdoor conditions. Several designs of fluorescent-lamp luminaries for street lighting have been tried experimentally. These luminaires have been mounted on roadways for observation of lighting effectiveness, and full light distribution data obtained.

Advantages and Disadvantages

In summary of the findings to date, flourescent lamps have several advantages and also several disadvantages for street lighting. The advantages include high efficiency of light generation, low brightness, relatively long life, and enhanced visibility on wet pavements due to broad streaks of brightness from an elongated source. The disadvantages include inherently low light output per foot of source, large size of luminaires, and necessity of jacketing in cold weather. Overall, flourescent street lighting is thus far at a marked disadvantage, as compared with present sources and practices, in visibility obtained per dollar of total lighting cost.

Appraisal Factors

To analyze the matter in greater detail, the factors in which one is most interested when appraising a new source for street lighting are:

1. Adaptability to designs of luminaires providing a favorable distribution of light flux, moderate absorption of emitted flux, reasonable suppression of glare, and satisfactory appearance;
2. Starting and operating characteristics under all weather conditions;
3. Novel features;
4. Hazards in service;
5. Cost of complete installation, taking into account the extent to which existing facilities may be utilized;
6. Cost of maintenance, including liability to breakage, reliability of accessories, any special skills or maintenance facilities required; and life characteristics of the sources as affecting maintenance practices;
7. Cost of energy;
8. And most important of all, the visibility of overall *seeing value provided per dollar of total cost.*

An original article by Kirk M. Reid (Affil.), Street and Highway Lighting Engineer, General Electric Company, Nela Park, Cleveland, Ohio, prepared for publication in *Illuminating Engineering* and TRAFFIC ENGINEERING.

An appraisal of fluorescent lamps for utilitarian street lighting, in reference to the above listed factors, may be stated at this time as follows:

1. Adaptability to Design

Elongated tube sources, if positioned crosswise of the street, are particularly effective on wet pavements because the reflected streaks of brightness are broad and not uncomfortably bright.

With such sources, luminaires may be designed to direct a good proportion of the light flux to the street near the lamps. However, the illumination is "spotty" because the relatively large diameter of the tubes (compared to filament sources) prevents redirection of adequate flux to the street surface between lamps unless lamps are spaced much closer than in present practice or a very large optical system is employed with added obtrusiveness and cost.

Since fluorescent lamps are virtually opaque to reflected light, any "grid" construction (which might be employed to reduce the overall source dimensions) would result in considerable absorption of light. Flourescent lamp installations would be considered more comfortable by most observers because of the low source brightness, but the loss in visibility resulting from glare would be substantially the same as that from a comparable filament lamp installation. The governing factor in the case of loss in visibility is the candlepower in the direction of the eye.

Neither a 40-watt, 48-inch hot-cathode fluorescent lamp nor an 8-foot, 20-millimeter cold-cathode tube equals even a 2500-lumen filament lamp in light output. Where more light is needed, proportionately greater numbers of fluorescent lamps are required, and the resulting mass of luminaires may be considered too obtrusive for satisfactory appearance.

2. Starting and Operating

By means of proper auxiliaries, it appears feasible to start and to operate hot-cathode and cold-cathode fluorescent lamps from either a series or multiple supply.

Since fluorescent lamps give their rated or full efficiency only at an ambient temperature of 70 to 80 degrees Fahrenheit, luminaires for either hot-cathode or cold-cathode lamps must include provision for jacketing in order to avoid serious loss in light output during cold weather. Again, jackets would have to be removed in summer to avoid a rise in temperature above the optimum range.

3. Novel Features

The novelty of a proposed street lighting system employing fluorescent lamps would undoubtedly arouse public interest. Through this interest, officials responsible for traffic facility and public safety might be able to obtain more nearly adequate appropriations for street lighting service, which are in general now far below the amount clearly demonstrated to be necessary to obtain an optimum balance between cost of accidents and cost of lighting.

Fluorescent lamps offer possibilities of spectacular effects — for example, large luminous pylons such as were employed on some of the World's Fair roadways. It will not be surprising if merchants install lighting of this nature on some business streets for its advertising value. It may be noted that with fluorescent lamps it is possible to change the color of the light for special occasions by replacing "white" lamps with "green" or "red", without the loss in efficiency incurred when color media are placed around filament lamps. These are, of course, limited applications. The major part of street lighting is utilitarian in objective.

4. Hazards in Service

Service men accustomed to the high voltage of series street lighting circuits would presumably be competent to deal safely with the high voltage of cold-cathode fluorescent lighting. The only important difference is that the auxiliary transformer supplies a high voltage to cold-cathode fluorescent lamps, while the corresponding series IL transformer supplies a low voltage to filament lamps, as its common name of "safety coil" indicates.

If breakage of tubes or jackets should occur very frequently the relatively large amount of glass on the pavement might cause some traffic hazard due to blowouts or to swerving of cars to avoid glass.

5. Cost

Existing circuits could be utilized for the most part. New auxiliaries and new luminares would be required in all cases. The large size of the luminaires may be expected to result in greater cost. Heavier brackets, poles and pole foundations might be required to withstand the greater weight and windage.

6. Maintenance

It should be possible to design fluorescent lamp street lighting accessories, for either series or multiple supply, which would be reliable and would require relatively little servicing.

Special designs of maintenance trucks would be required to transport the elongated sources and jackets. With proper training and supervision, it may be presumed that maintenance crews would be able to avoid an undue amount of breakage of tubes and jackets in handling. It appears that life of hot-cathode fluorescent lamps would be relatively long on a street lighting schedule of operation and their output satisfactorily maintained to end of life. Unknowns affecting life in this service include the extent of mechanical breakage of elongated sources.

The useful life of cold-cathode tubing would be determined by the acceptable limit of depreciation of light output. A depreciation of 20 percent in light output is usually considered the limit of acceptable practice in street lighting, whereas in electric signs a depreciation of 50 per cent (with the proportionately long tube lives usually reported) may not be excessive.

The depreciation in light output proceeds at substantially the same rate in hot-cathode and cold-cathode lamps. While the electrical life of cold-cathode lamps may be very long, the life to a given percentage of initial output is no greater than will be obtained with hot-cathode lamps. Every indication points to the same useful life for lamps of both types in the immediate postwar period. The difference is that the cold-cathode tubes are capable of being used when no longer adequate to meet the required illumination value.

Cold-cathode tubes should, obviously, be replaced under a periodic group replacement plan of lamp renewal. Tube outages would be limited to those resulting from breakage or defects. Replacement schedules could be planned well in advance, and a minimum of maintenance truck mileage would be required. One would have to stay on guard, however, against any tendency to allow the tubes to remain in service too long, with attendant loss in their efficiency and lighting effectiveness. Group replacement would also be desirable for hot-cathode lamps on a schedule which avoids any considerable number of individual lamp failures.

7. Cost of Energy

The light emission per watt of fluorescent sources is high — more than double that of the common sizes of filament street series lamps. Leaving out of consideration the above-mentioned costs of installation and maintenance, a more efficient source offers the same amount of generated light for less energy cost, or more light for the same energy cost.

8. Seeing Value per Dollar Cost

From the standpoint of the public, the all-important consideration in summarizing the above factors is the visibility obtained per dollar of total lighting cost. From this standpoint, as already stated, fluorescent street lighting thus far is at a marked disadvantage. This results from the inherently low output of a tube, and the lack of compactness of source. I know of no developments which give promise of substantially altering this limitation.

Naturally, researches on fluorescent lamps, as on other types of light sources, will continue. Some future development, not now foreseen, may open up the possibility of a fluorescent lamp street lighting system which would give the public greater value than present sources and practices. If that occurs, however, it should be kept in mind that it takes several years before any radical development is perfected for widespread application. That has been the history of lighting progress.

Buffalo's Postwar Traffic Plans

by HENRY W. OSBORNE

THIS community, in the past twenty-five years, has created a street system which has kept us out of the mud and ruts, but many unsatisfactory traffic conditions have developed. The present city officials must plan to eliminate these in the post war period—sooner, if money and materials are available.

It has been estimated that Buffalo's 1942 accidents cost the community $1,510,000. No estimate has been made of the cost of traffic delay and congestion to 200,000 motorists. This tremendous figure represents $670,000 for fatal accidents (assuming $10,000 each for 67 fatalities), $340,000 for personal injury accidents, and $500,000 for damage done to 10,000 motor vehicles. This all happened during 1942 when we were supposed to be conserving our transportation resources and squeezing every available man hour into war production.

The Board of Safety, executive head of the Division of Safety, City of Buffalo, in its August 1943 report to the Mayor's Post War Planning Committee, entitled "Post War Traffic Plans," placed emphasis on the modernization of traffic control signal heads and traffic controllers, reflectorization and rehabilitation of stop signs, the installation of duct lines and overhead cables to make possible the coordination of traffic signals, and the need for the redesign of certain key primary street intersections.

The report points out the need for establishing a Terminal Authority to

This article originally appeared in the *Municipal Signal Engineer*. Henry Osborne (Mem.) is Traffic Engineer for the City of Buffalo, N. Y.

solve terminal problems, such as retail parking lots, throughout the city. Other important items are the modernization of the city's street lighting system and the lending of all possible assistance to the State authorities responsible for the planning and building of a Lake Front Thruway and incident street and highway improvements which are vital to the movement of local traffic.

These plans and projects will cost approximately one million dollars. For brevity, a concise description and estimate of cost is made:

Project 1. Field Survey & Plan Preparation—Cost: $35,000

The project includes 500 traffic volume surveys and like number of condition surveys with graphic, statistical and analytical reports. From these, city departments needing this type of basic information may prepare plans and specifications for traffic facilities.

Project 2. Traffic Control Devices — Traffic Signals, Equipment, Etc.

Total Cost—$216,000	
Signal Controllers	$57,500
Coordination	90,000
Traffic Signal Heads	28,000
Poles	18,000
Equipment	22,500

After an extensive inventory of Buffalo's traffic signal control equipment, it was found that the system is 15 to 19 years old. Little imagination is needed to realize the difficulties that traffic officials have had during these war years to make this system keep up with wartime needs. Our worries multiply many times when we think of the job this system may have to do in the Post War Era.

The Police Signal System recommends that at least 50 intersections be equipped with traffic actuated devices, 100 new traffic signal controllers for other intersections, 10,000 lineal feet of underground facilities, and 50,000 to 100,000 feet of interconnecting cables.

To comply with uniform standards, as set forth in the manual on "Uniform Traffic Control Devices for Streets and Highways," compiled by the American Association of Street Highway Officials, the Institute of Traffic Engineers and the National Conference on Street and Highway Safety, the city's two lens traffic signal heads will be converted or replaced with three unit devices to include red, amber and green lenses. Where traffic movements may be facilitated without hazards to foot traffic, plans call for right turn movements at traffic signal locations during the cross street green period. This will necessitate additional equipment.

The present supports for traffic signal heads will be replaced with steel poles of sufficient height and strength so that the new and heavier traffic signal heads may be placed more advantageously in the roadway and eliminate need for backguys. New equipment such as tower trucks, concrete mixers, machine shop tools, and paint machines must be provided to make possible the fabrication and installation of the new control devices.

Project 3. Traffic Control Devices — Traffic Signs

Total Cost—$57,500.

It is estimated that there are 45,000 traffic control signs on the streets of this city. Only 25% of 4,000 "Stop" signs are reflectorized at this time. The plan calls for the use of beaded reflecting materials for "Stop" signs and other prohibition, informational, and one-way signs. The success experienced with this type of material on a test group of "Stop" signs,

fabricated in the Police Department's sign shops, has brought acceptance by city officials and the public.

We cannot wait until the war's end, for vital war transportation movements must be protected now. That is why every effort is being made to put this part of the plan into operation immediately.

Project 4. Traffic Islands, Loading Zones, Etc.

$50,000 has been requested as a start in the installation of pedestrian islands, mass transportation loading zones, and medial type islands for piers at railroad overpasses. These devices will separate and provide pedestrian havens and specific channels for vehicular traffic. This city plans to use accepted and proven island designs and techniques from Milwaukee, Wisconsin and the New Jersey State Highway Department.

Project 5. Intersection Redesign

Conditions existing in many of the major intersections of the primary road net warrant intersection redesign, some by channelization at grade—others by separation of cross traffic streams.

The outstanding project will be the complete separation of pedestrian and vehicular traffic in Niagara Square, which is the central business district. Pedestrian right-of-ways will be depressed, utilizing all available open-air spaces in the center of the 300′ traffic circle. Tunneling will be held to a minimum because of the cost, lighting problems, and other objectionable features.

Other redesign projects to be considered by the Board and the Department of Public Works will cost approximately $2,000,000.

Street widenings are recommended at only those points on the major road net at intersections and other places where commercial establishments demand curb parking. In the former case, accelerating and decelerating lanes will be provided at signalized locations.

Project 6. Off-Street Parking Facilities

Instead of an extensive program of street widening after the war, it is recommended that a less expensive means of increasing street capacity be used; that is, first, the installation of community and public parking lots and elimination of curb parking. The report makes pertinent statements such as: "Regardless of street width, curb parking causes interference and delay to traffic movements"; "Lack of parking in business districts causes a tremendous downward trend of property values"; "It is cheaper to build parking lots than to widen streets."

The Board of Safety recommends and urges the establishment of a Terminal Authority which should have the means, technically and financially, to establish off-street parking facilities, bus and truck terminals, and others.

Project 7. Street Lighting—Total Cost: $400,000

Buffalo must do something to reduce traffic fatalities—Street Lighting is an answer.

Location spot maps show that these fatalities are occurring on primary and secondary traffic routes at important intersections where vehicular and pedestrian traffic is heavy. These locations require more light of the proper type. The Board of Safety recently has directed the staff to make a comprehensive study, with recommendations, to eliminate night time traffic difficulties. The Board plans to use the Illuminating Engineering Society's street lighting standards and examine the techniques Detroit, Michi-

gan and Milwaukee, Wisconsin have employed in solving their lighting problems.

Project 8. Highway Planning

Approximate cost of Frontier projects: $20,000,000.

The Engineering Staff of the Division of Safety is busy preparing traffic data for the proposed Niagara Frontier Thruway, which will be the means of linking the commercial, industrial, residential, and recreational areas of a million and a half people in western New York and Ontario, Canada. One of the most necessary and vital parts of the plan will be the design of a distribution system within the congested downtown Buffalo area.

We hope to be prepared to handle traffic movements, either vehicular or pedestrian, soon after the close of the war. It is a "Must," for the public, according to a national poll, have placed a new car as the number *ONE* item on the list of those things they want to buy as soon as possible after victory.

SURVEY OF STATE HIGHWAY PLANS

THE seriousness with which states are flinging themselves into the task of planning for postwar construction was one of the highlights of a state highway survey completed April 15th by the Streeter-Amet Company of Chicago, manufacturers of Traficounters, with some returns indicating that if the war ended next month construction programs could be readied almost immediately.

The poll, aimed at the survey departments of forty-eight states and the District of Columbia, dwelt largely on the question, "What general planning is your department doing now in the way of postwar preparation?" In connection with this question, there was further elaboration to inquire about some of the problems encountered and to ask about the extent to which mechanical counting equipment helps in the field work.

In setting forth the first question, the Streeter-Amet questionnaire struck something of a misnomer in that several of the returns did not dwell so much on general plans as on specific work that has been completed. An outstanding example was this return from a state in the mid-west area where the director of planning replied, "An assembly of projects has been made, that is, a pool is *ready* from which a program can be drawn."

Returns at the time of this compilation had reached approximately forty per cent, with eastern and southeastern states leading in replies, although each region had some representation. The following is a cross-section verbatim report of state highway plans for postwar preparation, in answer to the general question of what planning was being done now:

State A—"(Our state) at the present time is engaged in the preparation of plans to the blue print stage, for a complete modernization of the State Highway System. We are also encouraging local governmental units to give consideration to the improvement of their respective highway systems."

State B—"We are deeply involved in the preparation of plans and specifications for a large postwar highway construction program. Many traffic engineering studies have been made and there are many more to come."

State C—"We are making exhaustive planning studies of possible limited access expressways into the hearts of our larger cities. Traffic recorders are used periodically for traffic counts on urban streets and for determining

An original article by the Streeter-Amet Company.

changes in traffic at scattered points on our rural highways."

State D—"This department is now planning for a postwar program of road and bridge construction amounting (if funds become available) up to ten million dollars annually for a period of at least three years. The road program covers both primary and secondary routes, with traffic knowledge being of great importance in establishing priorities and routing."

State E—"An extensive plan for new roads and improvement of old roads is in the making."

State F—"Mainly origin and destination traffic surveys. Main problem—shortage of engineers, designers, draftsmen, technical men."

State G—"Continuing traffic survey on State Trunk system; preparing for a traffic survey of secondary and feeder roads, and possibly municipal streets. Mechanical counting equipment is indispensable in this type of work."

State H—"Highway planning in (state) continues to gather data for use in current and long range programs of planning." Mentions correlation of present traffic conditions to normal conditions as one problem.

State I—"As a planning department we are making a number of traffic surveys for the commission as basis for plans, using ten portable counters continuously."

One highlight of the summary is the scant mention by highway survey departments of problems—financing, for instance, of the projects that are being planned—indicating a feeling among highway departments that these problems will take care of themselves if the big job, that of laying project groundwork, is well planned and ready when the time arrives to begin work.

Operation and Safety of Limited Access Highways

by HARVEY D. BOOTH

FORTUNE MAGAZINE for June, 1941, with its story on the United States highway system, carried an aerial picture of a section of the Pennsylvania Turnpike with the caption—"The Pennsylvania Turnpike is Proof Against Every Road Hazard Except a Fool and His Car."

On the opposite page a number of roadway signs were illustrated, and the story went on as follows:

"Such warning signs as those on the opposite page do not exist along the Pennsylvania Turnpike because there is no reason for them. A driver can average 60 miles an hour and thus cover the 160 miles of the highway in about 2½ hours. Straight sections permit 100 miles an hour pace without discomfort, but most cars cannot take advantage of the opportunity. Unlike ordinary roads, the Turnpike is the first American highway that is better than the American car. As such it will represent the maximum in road construction for many years."

Whether this last statement of the *Fortune* writer is correct or not, time and more experience will tell. The caption referred to—"The Pennsylvania Turnpike is Proof Against Every

Taken from a talk given by Harvey Booth (Assoc.), Traffic Engineer, National Safety Council, before the Highway Engineering Conference, Boulder, Colorado, January 7, 1944.

Road Hazard Except a Fool and His Car"—raises the question: "Who is responsible for motor vehicle accidents?" Is it the road, the car or the highway user? I think we can agree that if all highway users acted perfectly, and at all times drove or walked in a manner consistent with the condition of the vehicle, as well as all highway conditions, there would be no traffic accident problem.

Are highways the cause of traffic accidents? Without debating the proposition or elaborating upon the subject, most traffic authorities of my acquaintance agree that highways alone are not the cause, but improper or inadequate highway design, in combination with the average highway user and his failure to function properly, is the combination mainly responsible for accidents and congestion.

As Arnold H. Vey of New Jersey, Traffic Engineer, now on leave in the Armed Services, has put it:

"Roadway facilities designed and applied which are as inherently safe as it is possible to construct them, render the failures of human beings of lesser or little importance. It is less possible for drivers to perform improper practices causing accidents. . . . It is necessary, in order to cope with the weaknesses of the highway user, to provide highways into which are constructed all of the known safeguards economically possible.

"Such improvements would include controlled or limited rights-of-way, physical separation and segregation of conflicting flows of traffic, adequate shoulders for stopping, sufficient sight distance at curves, hills and intersections, pedestrian sidewalks or pathways, proper and sufficient highway lighting, plus many other advanced features now familiar to the highway engineer."

In discussing the operation and safety of limited access highways—or safety in use—I should like to propose a fairly broad definition such as:

"A highway upon which, to as great extent as possible, all conflicting or interfering flows of traffic or movements have been eliminated by physical separation, segregation or control."

Stated another way, when we speak of limited access highways, do we mean the mere control over access to abutting property, or are we concerned with control of the traffic streams within the right-of-way as well? Such a highway differs from ordinary highways in at least four important characteristics, from the standpoint of safety and efficient operation:

1. Division of opposing streams of traffic.
2. Insulation against uncontrolled access and marginal interferences.
3. Complete separation of all cross traffic.
4. Design of the cross-section for accommodation of same direction traffic of different speeds.

The movement problems, in addition to the general to and fro operation are simply entering, leaving and crossing. It is in connection with these operations, of course, that accidents occur. I shall discuss these briefly in relation to the four characteristics just enumerated, both with respect to what purports to be a theoretically perfect highway and the partial application of these principles where more elaborate facilities cannot be economically justified.

Separation of Opposing Streams

It seems elementary today to say much about the physical separation of opposing streams of traffic. The dual or divided type of highway is coming into fairly extensive use. Design standards for modern traffic generally indicate the desirability of physical

separation of opposing streams on all roadways of four or more lanes.

Reliable statistical information is not too readily available, but from a study by Mr. Vey of accidents on the New Jersey state highway system in 1934, the following results were reported:

Lanes	Million Vehicle Miles	Accidents	Accidents Per Million Vehicle Miles
3	390.85	1,378	3.53
4 (Undivided except 35 miles)	483.21	1,743	3.61
2	1178.78	3,241	2.75

From this analysis, the average accident rate equals 3.10 accidents per million vehicle miles, and it is interesting to note that four-lane highways of the undivided type are more hazardous than either two or three lane roads. Mr. Vey says that of the many possible explanations for this, he thinks the primary one is, the wider the road the more flexible the movement of traffic from one side to the other, unless congestion or enforcement prevents such movements.

By accident types, it was found that the per cent of right angle collisions decreased with the width, as did head-on collisions and fixed object collisions. Same direction accidents, however, increased with the width, while opposite direction accidents (involving a left turn) and pedestrian accidents fluctuated without regard to number of lanes.

Further analysis was made with respect to the relationship between daily volumes and accidents per million vehicle miles. It was found that as the average daily traffic increases, accidents likewise increase up to approximately 7,000 vehicles per day, which many authorities consider to be the capacity of a two-lane highway. Beyond that point, primarily because of congestion and the consequent decrease in speed and flexibility of vehicle movement during heavy traffic hours, there is a gradual decrease in the accident rate despite the increase in traffic.

On the other hand, to show how other factors which are not right can nullify an important improvement, on a section of Route 6 in the City of Elizabeth, New Jersey, following construction of a center island and some other important changes, same direction accidents increased from 21 to 47 during comparable periods. This was determined to be the result of not properly relocating traffic signal units at the ten signalized intersections along this stretch of highway after the improvement. During this same period, however, head-on collisions were eliminated and the over-all death and injury total was substantially reduced.

Medial Strips

The medial strip should be of sufficient width to eliminate or reduce headlamp glare and other factors. Of course the medial divider must be of a type to discourage crossing or at least make it difficult if not physically impossible. An analysis by the Washington State Highway Department of the 1939 experience on 65 miles of a four-lane highway divided by a medial strip four feet wide, aparently with nothing to prevent vehicles crossing from one portion to the other, showed an accident rate of 4.11 per million vehicle miles, while on a 175-mile section of two-lane highway the rate was 3.95.

There are other examples of the type of results we normally expect from the construction of center islands. I shall cite two from New Jersey:

On Route 26, in North Brunswick Township, "between intersection" accidents were reduced from 11 to 5 during 5 months' before and after periods.

On Route 25, in Cinnaminson and

Delran Townships, between intersection accidents were reduced from 23 to 10 during nearly a year before and after periods.

Turning to the West Coast, a report just released a few days ago covering the total accident experience on the Arroyo Seco Freeway in Los Angeles, a distance of 4.3 miles, shows accident rates per million vehicle miles for the years 1941, 1942 and 1943 (through December 20) of 1.23, 0.95 and 0.91 respectively. There was but one death during the three years.

Insulation Against Marginal Interferences

This characteristic is probably the newest development in many states, and one which requires legislative authority for its fullest application.

In a small number of cities comparatively short sections of roadway of the limited access type have been constructed. So far as I know, there are only two highways of any considerable mileage embodying full application of the principle of limited access or freeway design—the Merritt Parkway of Connecticut and its New York connections, and the Pennsylvania Turnpike.

There must be complete right-of-way control, with necessary service roadways paralleling so that local traffic can get in and out, with points of entrance and exit a reasonable distance apart. Generally, exclusion of traffic applies to pedestrians as well as to motor vehicles, but if the freeway passes through an area where pedestrians are likely to get onto the right-of-way, sidewalks or pathways must be provided.

In connection with the service facilities which go with the limited access highway, consideration must be given to the type of vehicles which will use the service roads. For example, Robert Moses of New York, who directs the great parkway system of that city and under whose supervision much of the parkway mileage was built, found the problem somewhat complicated by trucks, buses and other miscellaneous vehicles. Radii of curves and turns must of course be greater for larger vehicles, and entrance and exit roadways and lanes must be such that through traffic lanes will not be fouled by the turning vehicles.

Separation of Cross Traffic

We recognize the value of separation of highways at grade for many heavily traveled roadways not of the freeway type. On the freeway or limited access routes, grade separation structures and proper interchange facilities are fundamental.

Intersection interchange facilities must be designed to fit the traffic load of the respective routes. In fact, at intersection with some minor or unimportant routes there may be no need for any interchange facilities.

At other locations the cross routes may be such that a modified clover leaf design will suffice, with connecting ramps in two quadrants of the intersection. Full clover leaf design with the two roadways or ramps in each quadrant should be provided where both routes carry heavy traffic, so that all interchange movements can be made without any interference with other traffic.

Radii of these interchange roadways, as well as the grade of the ramps, must be considered with respect to the type of traffic to be served.

Design for Speed Variation

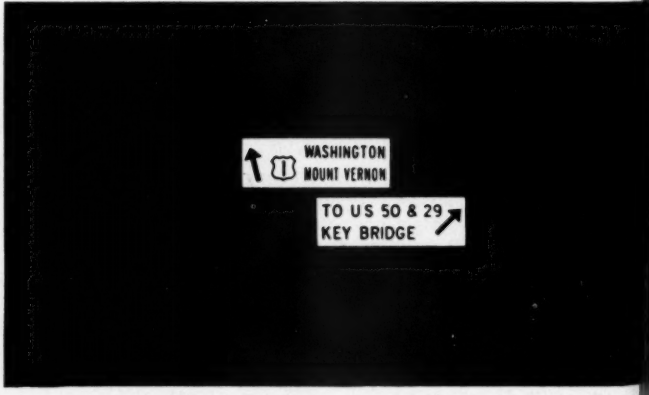
Factors which require a brief word of consideration in connection with the design of the cross-section for accommodation of same direction traffic of different speeds are: Lane width,

Scotchlite REFLECTI GN

REG. U. S. PAT. OFF.

Here's the Made-to-

SCOTCHLITE



EASIER TO READ

EASIER TO APPLY

EASIER TO MAINTAIN

★
BUY
MORE WAR
BONDS!
★

When writing advertisers, RAFF

TIGN MATERIAL *24 Hour Visibility*

o-er Reflective Sign Material

OR NIGHT AND DAY VISIBILITY

SCOTCHLITE reflective sign material is a flexible, glass beaded sheeting, easy to use, low in cost and a time saver in sign maintenance. "SCOTCHLITE" can be applied to entire sign surfaces—a feature that saves time and money by eliminating background painting because the four colors of white, yellow, silver or red are variety enough for all types of highway signs and markers. It is brilliant and highly reflective at night making signs easy to see—easy to read. There's no glare or distortion.

"SCOTCHLITE" is available in roll or sheet form and is easy to apply to new or old signs of metal, wood or masonite. Special equipment is unnecessary for installation.

Why not write today for further information and prices on "SCOTCHLITE"? There is no obligation. Just mail the coupon below.

MINNESOTA MINING AND MANUFACTURING CO.

GENERAL OFFICES: SAINT PAUL 6, MINN.
BRANCHES IN PRINCIPAL CITIES

Write today for this informative free booklet on "SCOTCHLITE"

TE544

Minnesota Mining & Manufacturing Company
900 Fauquier Avenue, Saint Paul 6, Minnesota

Gentlemen: I'd like a copy of the booklet on "SCOTCHLITE".

Name _____

Address _____

City _____ Zone _____ State _____

degree of curvature, acceleration and deceleration lanes.

Width of lane is important in providing area in which vehicles may be maneuvered without the danger of rear-end collisions, side-swipes, and cutting-in collisions,—the three more or less common types of accidents involving vehicles traveling in the same direction. On curves and hills this becomes of particular importance, as greater transverse space may be required for high speed vehicles on curves, while one can never be sure what will be in his lane over the crest of a hill.

The same requirements for stabilized shoulders and suitable roadside space in which vehicles can be parked out of the traveled way pertain to limited access highways as much as to the ordinary two-lane roadways. If the modern facility is through an urban area where outside curbs are required, then an additional pavement width for a parking lane will be mandatory. An example of this principle of design is carried out in the 6th Avenue project at Denver.

Curves will be designed with the lowest possible degree of curvature to provide an ample margin over the anticipated maximum speed, with proper spiraling and super-elevation to make it easy for each vehicle to stay in its lane.

Acceleration and Deceleration Lanes

Necessary adjuncts of the high speed modern highway designed for safety and efficient, rapid handling of required volumes are acceleration and deceleration lanes, by which entering vehicles are merged with the through traffic and leaving vehicles are separated from the traffic stream with a minimum of interference to vehicles behind.

There was much disappointment as well as a lot of disagreement in the first acceleration and deceleration lanes constructed a number of years ago. The principle was sound but they didn't work too well. It has been repeatedly demonstrated that slowing or merging vehicles will cause accidents to impede the normal flow of other vehicles if these auxiliary lanes are not long enough and wide enough to attract motorists who should use them.

Since highway builders are always pressed with considerations of economy, the few hundred feet additional actually needed for full-size acceleration and deceleration lanes have been easy to chop off.

Some highway engineers even contend that these lanes are not required. If accidents resulting from entering and leaving movements are to be avoided, then something more than stop signs or traffic signals must be provided. Slowing abruptly for a right turn, or entering the high speed traffic stream from zero speed are not conducive to safety. We cannot provide a giant catapult to set a car down in the middle of a moving stream of traffic going full speed ahead, nor a giant crane to reach down upon signal and snatch the leaving vehicles quickly and safely from the traveled way.

With these as with many other modern highway improvements, let us not overlook the importance of educating motorists as to their proper use.

Economic Factors

It is immediately apparent that the fundamental characteristics just discussed produce favorable operating conditions and for such tangible items as increased capacity, time saving, and accident reduction, the money value can to some extent be computed.

The increased lane capacity under the freeway principle will be almost

double the capacity of ordinary type highways—the capacity through an intersection at grade is actually less than half the capacity of the combined roadways.

A study by the Public Roads Administration (then the Bureau of Public Roads) in cooperation with the New Jersey State Highway Department, of the average per trip time saved by passenger car traffic via the Pulaski Skyway as compared to the former surface route, reveals the following results:

Vehicles Per Hour	Trip Time In Minutes Surface Route	Trip Time In Minutes Pulaski Skyway
200	8.6	5.5
400	9.0	5.55
600	9.2	5.6
800	9.6	5.7
1000	10.0	5.8
1200	10.2	5.9
1400	11.1	6.1
1600	12.6	6.3
1800	15.2	6.6
2000	22.0	6.9
2200	35.0	7.3

An analysis by Mr. Vey of 7,217 accidents on New Jersey state highways by type shows the following distribution:

Type of Collision	Per Cent of Accidents at Intersections	Per Cent of Accidents Between Intersections
Right angle	14%*	1%*
Same direction	10%	20%
Opposite direction:		
Head-on	3%	18%
Fixed object	2%	9%
Pedestrian	4%*	6%*
Opposite direction:		
Left-turn	5%*	1%*
Other types	2%	5%

It is apparent that by controlling the right-of-way prohibiting access at grade, as well as the elimination of all cross traffic at grades, there could, theoretically, be a saving of 31 per cent (the starred percentages). A suitable medial divider or island would prevent most head-on collisions, amounting to 21 per cent additional. Fixed object accidents should also be reduced, as well as those of pedestrians. Thus it may safely be assumed that well over half of all traffic accidents can be eliminated by proper design of the roadway. Some authorities estimate the potential saving as high as 75 per cent.

Certainly something can be done to reduce the 30 per cent of same-direction accidents—for example highway lighting at certain locations has been found definitely helpful.

If economic considerations do not permit as extensive modernization as may seem desirable, the ends of highway safety and efficient operation will be better served if that which is done is done well. To illustrate: Specify ample length and width of deceleration and acceleration lanes; provide ample turning radius on ramps and interchanges and for the service roads; insure full available, as well as apparent roadway width at over-pass and under-pass structures; do not try to stretch the total length of the project by building 10 foot lanes when 12 or 13 foot widths are necessary; and especially important—provide sufficient right-of-way width for all anticipated requirements, whether the modern roadway is scheduled for immediate or stage construction.

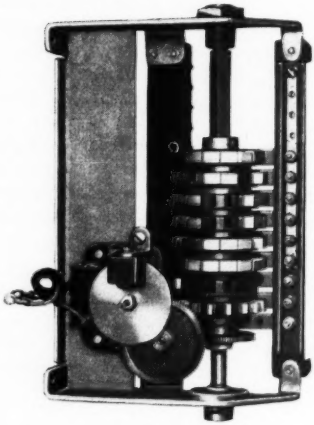
CAPACITIES

P.R.A. studies indicate maximum practical capacities of 2-, 3-, and 4-lane rural highways under normal conditions are 800, 1400, and 2800 vehicles per hour, respectively, in both directions. This is assuming good alignment and minimum sight distance of 1000 feet.

REGISTRATIONS

It is estimated (P.R.A.) that 1944 m.v. registrations will drop to 28,400,000 vehicles, of which about 4,400,000 will be trucks. This is 17.6 per cent below the peak registration year of 1941. In 1942 the drop was 5.5 per cent and in 1943, 11.5 per cent.

TRAFFIC CONTROLLERS



Cam Unit

PLANNED FOR THE FUTURE

This cam unit is just one example of how Crouse-Hinds controllers are engineered for the future.

Note these exclusive features:

1. Cams have detachable lobes. Permits complete resetting of color sequence without installation of any new parts.
2. Cams are colored red, amber, or green. Simplifies tracing of circuits.
3. Motor driven cam shaft. Gives dependable smooth operation resulting in long life and minimum wear.

When you install a Crouse-Hinds controller, you automatically plan for the future. The utmost flexibility is built into the controller, and you may be sure that it will take care of your requirements for many years to come.

CROUSE-HINDS COMPANY

Syracuse 1, New York, U.S.A.

Traffic Control Devices for Los Angeles School Child Protection

by R. T. DORSEY

Los Angeles has achieved a 54 per cent decrease in traffic accidents affecting school children during the past five years. This marked reduction in traffic accidents, despite a heavy increase in population, can be attributed, at least in part, to the traffic engineering principles carried forward by the city's civic authorities.

The year by year record for traffic accidents to school children going to and from school is as follows:

1938-1939	233
1939-1940	220
1940-1941	197
1941-1942	173
1942-1943	106

During this period of time, fatalities totaled 16, an average of 3.2 per year.

Size of the Problem

This city has a particularly difficult problem because of its great area and the high concentration of motor vehicles. Los Angeles has an area of 450 square miles, with an estimated motor vehicle registration within the city itself in excess of 800,000. The population in the 1940 census of 1,504,000 has been increased to an estimated 1,750,000. The city has more than 5,000 miles of streets, involving approximately 28,000 intersections. Of the total of streets, 2175 miles are permanently paved.

There are in Los Angeles, as of February 1944, 292 elementary schools, with an average attendance of 130,992 children, and 31 junior high schools, with an average daily attendance of 41,252. There are also 44 senior high schools, with an average attendance of 56,723 but as students of high school age are adults from the standpoint of traffic hazards, the problems at senior high schools are met on the same basis as similar numbers of adults.

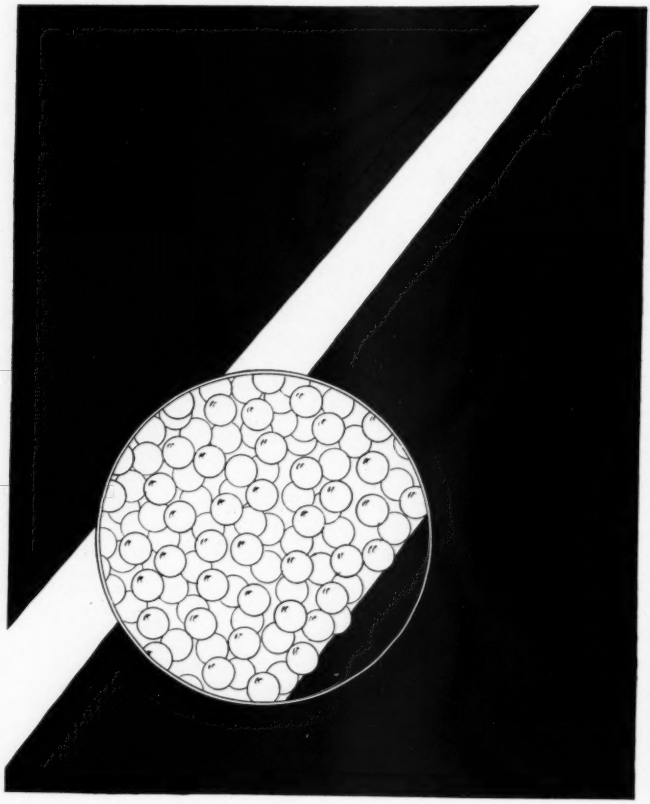
The approach to the school child protection problem is based on the volumes and speeds of traffic, widths of roadways, approach visibility and the number of school child crossings.

Pedestrian Tunnels

At locations where the most acute conditions prevail, particularly immediately adjacent to school property, the normal solution in the past has been the construction of a school tunnel. At the present time there are 110 completed pedestrian school tunnels within the city, of which 87 were constructed primarily for the handling of school children of elementary and junior high school age. These tunnels cost a total of $925,500, individual tunnels ranging in cost from $4,000 to $30,000. *Studies made show that there is better than a 95 per cent obeyance of school children in the use of the tunnels.* Construction of school tunnels,

An original article by Ralph Dorsey (Mem.), City Traffic Engineer of Los Angeles, California.

PRISMO "LIFELINE"



Magnify Safety

. . . with PRISMO

THE PRISMO SAFETY CORPORATION

HUNTINGDON · · · · · · · PENNSYLVANIA

When writing advertisers, please mention TRAFFIC ENGINEERING

although at a standstill during the present war, has been generally very satisfactory. There are, however, several minor objections to them, among these being the fear of parents of crimes committed in them and the difficulty of keeping them in a sanitary condition. Also it is found that children riding bicycles to school have difficulty in taking their bicycles up and down the steps of the tunnels.

Traffic Signals

The use of traffic signals under certain conditions is good protection to school children. There are approximately 900 traffic signals in operation within this city at the present time. Some of the schools are so located that children can take advantage of signals primarily placed for the regulation of general vehicular traffic, but there are also a number of locations where the signals have been established primarily for the protection of school children. These signals are operated only during school hours on days when schools are in session. The use of the boulevard or arterial stop has also been taken advantage of when conditions so permit. When a school is located adjacent to two relatively minor traffic thoroughfares but where speeds tend to be high, it has been found feasible to stop traffic in all four directions at the intersection closest to the school property. Such devices are used only when the delays caused by stoppages have no material effect on the general traffic pattern.

Guards vs. Signals

A traffic signal provides the stoppage of traffic on a main thoroughfare for a sufficient time for a pedestrian, at a normal rate of speed, to cross the roadway, this period of time occurring at each full cycle of the traffic signal, the cycles ranging from 50 seconds to one minute. It is therefore assumed that if the volume of traffic is so light or so pulsated that an equivalent period of time between trains of moving traffic will occur on an average of at least one per minute, that the assignment of a crossing guard is not essential.

On average width roadways, under normal conditions, it is found that sufficient gaps between moving trains of traffic will occur at least once a minute when volumes of traffic do not exceed approximately 500 cars per hour. However, careful consideration is given to all occasions where volumes exceed 300 cars per hour, and when special conditions so justify, guards may be placed at crossings between 300 and 500 cars per hour. When traffic exceeds 500 cars per hour, special protection at a regularly established school crossing is considered essential. When crossing guards are not immediately available, regular police officers are temporarily assigned to this work.

Crosswalks

Special school crosswalks are established at all surface locations where considerable numbers of school children cross the street. These include the painting of crosswalk lines, the installation of appropriately marked arrows denoting the approach to a school crosswalk, and the posting of large curb signs also calling attention to the approach to a crosswalk. These school crosswalk installations are also made at intersections where the volumes of traffic are relatively light but where it is desirable to advise approaching motorists of the presence of a school crossing and to help to concentrate the movements of school children to the designated crossing.

It is estimated that with the use of these devices, that the chance of a school child being killed in Los Angeles on a trip on the way to or from school does not exceed one in thirty-two million.

TRAFF-O-MATIC

SEMI-ACTUATION

Traff-O-Matic Dispatcher, Model 505

- Two-phase semi-actuated control of an intersection of a main street and a cross street.
- Green light is normally on main street unless required by cross street.
- Detectors on cross street only.
- Time extension and memory features.
- Actuation by vehicle detectors and pedestrian push buttons.

"Traffic Regulation with Intelligence"

AUTOMATIC SIGNAL CORPORATION

NORWALK, CONN. CHICAGO, ILL.

I T E NEWS AND PERSONALS

Many I.T.E. Members Attend Eno Conference

More than one hundred leading highway engineers, administrators, traffic engineers, educators and enforcement officials attended the Highway Traffic Conference held in New York City's Waldorf Astoria Hotel on April 14th under the auspices of the Eno Foundation for Highway Traffic Control. The purpose of the Conference, planned and directed by Charles M. Upham, Vice President of the Foundation, was to bring about more cooperative effort among highway traffic officials in meeting war and postwar problems.

Besides the many Institute members attending and taking part in the discussions, the following members served as speakers: Harold F. Hammond, President, Institute of Traffic Engineers; G. Donald Kennedy, Vice President, Automotive Safety Foundation; Burton Marsh, Director, Traffic Engineering and Safety Department, American Automobile Association; Charles M. Upham, Engineer-Director, American Road Builders' Association; Theodore Matson, Director, Yale Bureau for Street Traffic Research; Wilbur Smith, Associate Director, Yale Bureau for Street Traffic Research; and Leslie Williams, City Planning Engineer, American Transit Association.

SPEAKERS AT HIGHWAY TRAFFIC CONFERENCE
Burton Marsh, H. G. Sours, L. A. Hince, Charles Upham, H. F. Hammond

Following the opening remarks by Mr. Upham who relayed Mr. Eno's welcome to the group (Mr. Eno was not able to be present), Harold Hammond, President of the Institute of Traffic Engineers, addressed the morning session. He urged designers of postwar highways to build more safety into their designs. This can best be done, said Mr. Hammond, by having all designs checked by traffic engineers familiar with operating problems.

T. E. Sessions at California Safety Assembly

Lighting The Way to Safety, Freeways and Their Development, Freeways and the Transportation Problem, and Engineering and Traffic Control, were topics of the sessions of the Traffic Engineering Section at the California Safety Assembly, which took place in Los Angeles on April 12, 13 and 14.

Section Chairman was Ralph T. Dorsey, City Traffic Engineer, Los Angeles. Other Institute members who took part included the following: D. Grant Mickle, who talked on "Traffic Engineering From a National Viewpoint"; J. W. A. Bollong, Seattle, Washington, City Traffic En-

TRAFFIC POSTER of the MONTH

Each month the National Safety Council issues along with its other posters devoted to Public Safety subjects, a Traffic Safety Poster for the use of police departments, local safety councils, civic organizations and others carrying on active traffic safety campaigns.

In Color, Size 25" x 38"

This month's poster, "Make 'Em Last," combines a conservation message with a word of caution for saving tires and lives—"Don't Drive Fast."

PRICES (12-MONTH STANDING ORDERS)

NO. OF COPIES	
1 to 24	25c each
25 to 49	20c each
50 to 99	18c each
100 to 499	16c each

IMPRINTING: Organization Name.....$1.25 per Month

NATIONAL SAFETY COUNCIL, Inc.
20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

gineer, who spoke on "Traffic Engineering From the Viewpoint of the City Traffic Engineer", and Ross T. Shoaf, Assistant Traffic Engineer of San Francisco, who talked on "Parking Terminal Facilities".

Yale Traffic Engineering Conference

Thirty city and town engineers attended the five-day Traffic Engineering Conference sponsored by the Connecticut Traffic Safety Commission and the Yale Bureau for Street Traffic Research April 17-21 at New Haven. Under the joint direction of William Greene, Director of the Connecticut State Traffic Safety Commission and T. M. Matson, Director of the Bureau of Street Traffic Research, the five days were devoted to talks and discussions on meeting the postwar urban traffic problems. Tom Willier and Wilbur Smith of the Bureau staff served as assistant directors. Guest speakers included the following Institute of Traffic Engineer members: Norman Damon, Burton Marsh, Harold Hammond, and Leslie Williams.

Massachusetts Safety Conference

This 23rd Annual Conference, April 24-25, organized by the Massachusetts Safety Council, and its many cooperating agencies, was devoted to the theme of War Production and Civilian Cooperation.

Institute members who took active part in the two-day conclave were Ned H. Dearborn, who was a speaker at the Governor's Luncheon; Harold Hammond, President, Institute of Traffic Engineers, and Edgar F. Copell, who were speakers at the Highway Safety Session; and Dr. T. W. Forbes, who participated on the panel at the Commercial Vehicle Session.

Michigan I.T.E. Section April Meeting

Sixteen members and guests of the Michigan Section attended the regular meeting on April 18th in Detroit. The group enjoyed exceptionally fine Smorgasbord as a prelude to a two-hour technical session on post-war planning for traffic engineering.

The group attended the opening game of the baseball season between the Detroit Tigers and the St. Louis Browns prior to the meeting.

Attending were the following.

Ross Harger	Sidney Anger
Holden LeRoy	Henry Barnes
Joe Wehmeyer	Max Halsey
Art Knoske	Tom Walbert
John Dobelek	Carl McMonagle
Ed Shulman	Fred Hurd
Herbert McCaske	Lloyd Braff
Al Malo	James Murphy (guest)

During the evening's discussion, it was announced that the Michigan Section will sponsor a special "traffic engineering dinner" following the traffic engineering sessions at the Annual State-Wide Safety Conference of Michigan on May 25th in Detroit.

The Michigan Section will sponsor an Institute headquarters at the conference.

New York I.T.E. Section April Meeting

Sixteen members and guests of the New York Section met at the Hotel Holley on April 27th, under the chairmanship of Virden Rittgers, for an enjoyable dinner meeting. It was the longest meeting on record, with the discussion holding forth until midnight.

It was decided to hold some sort of a social event during the summer months, and a committee was appointed to plan for this. The committee, composed of Leslie Williams, Graham Cole, and Henry Evans, will

Traffic Problems Solved with TRAFICOUNTERS *in Lansing*

"We use Traficounters successfully in several ways", says Sidney Anger, city traffic engineer, Lansing, Michigan.

"We use them: (1) To obtain traffic figures for our city engineering department in preparing priority requests for street surfacing material. (2) Traffic volume counts in 43 strategic locations. (3) To count traffic at signal controlled intersections to determine what period of the day the signal is not required. (4) To help determine corrective measures at locations where accidents have occurred. (5) To determine degree of hazard at railroad crossings. We first purchased two of the modern RC Traficounters in December, 1942 and found them so simple to use and so successful in obtaining desired results that we purchased two additional counters in April, 1943, and have another on order".

Traficounters are available now. Send for a bulletin giving complete details on the Streeter-Amet Traficounter.

STREETER AMET COMPANY

4101 Ravenswood Avenue Chicago 13, Illinois

Traficounter

also assist Harry Koch in planning the next meeting, at which Mr. Koch will be chairman.

Stuart Hawley, who returned recently from a sojourn in the Florida Keys told the gathering of his trip. Following this a short humorous film was shown. Then Nathan Cherniack, Economist, Port of New York Authority, presented a talk on the development and future plans of this organization.

Those attending were as follows:

Virden Rittgers, Chairman	Stuart Hawley
Henry Evans, Secretary	Tom Willier
Paul Green	Wibur Smith
Graham Cole	Bruce Greenshields
Nathan Cherniack	Richard Wilcox
John Gibala	W. C. Jaeger, Jr. (guest)
Leslie Williams	Walter Spratt (guest)
Harry Koch	J. T. Sehulster (guest)

LOOKING AHEAD

INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION, INC. 49th Annual Meeting, Hotel Statler, Boston, Mass. October 2-3-4-5.

INSTITUTE OF TRAFFIC ENGINEERS Annual Meeting, Chicago, October 1, 2, 3 and 4.

SOCIETY OF AUTOMOTIVE ENGINEERS, National Transportation and Maintenance Meeting, Bellevue-Stratford Hotel, Philadelphia, Pennsylvania. June 28-29.

NATIONAL INSTITUTE FOR WARTIME TRAFFIC TRAINING, Northwestern University, Evanston, Illinois, June 19-30.

AMERICAN ASSOCIATION OF MOTOR VEHICLE ADMINISTRATORS, Annual Meeting, Chicago, Illinois, June 20-23.

CENTRAL STATES SAFETY CONGRESS, Kansas City, Missouri, June 6, 7, and 8.

ANNUAL MICHIGAN STATE - WIDE SAFETY CONFERENCE, Detroit, Michigan, May 25-26.

PERSONALS

WM. R. MCCONOCHIE (Mem.), Traffic Engineer for the Chicago Surface Lines, has taken a six months' leave of absence to make a study of public transportation facilities in the City of Washington, D. C., with the firm of De Leuw, Cather & Co.

LT. COL. LIGHT B. YOST (Affil.), on leave from General Motors Corp., recently received promotion to that rank, and is still serving as Transportation Officer for the Seventh Army. "Bud" has been transferred from Sicily and is now in Algiers. His address is A.P.O. 578, c/o New York City Postmaster.

MAJOR EDWARD G. WETZEL (Assoc.), Chief, Traffic Engineering Branch, A. S. F., on leave from the Indiana State Highway Commission, was very recently sent overseas. He writes "I see CAPT. JOHN BEAKY (Mem.) frequently and he and CAPT. GRAVELLE (Assoc.), my roommate, work together. Traffic Engineers are beginning to be recognized here as men who know how to handle transportation problems. I miss those monthly meetings (N.Y. I.T.E. Section). If I can round up enough members here we might organize a chapter."

MAJOR F. M. KREML (Affil.), on leave as Safety Division Director, I.A.C.P., serving with the U. S. Army Transportation Corps, has received a letter of high commendation from GENERAL MARK W. CLARK, commanding the Fifth Army. Among other things, it said, *"Under your capable supervision and direction, the vital elements of transportation within the Fifth Army have reached a new peak of effectiveness. . . . Your familiarity with the problems involved, combined with ingenuity and foresight have contributed substantially*

Armor-Flex Traffic Markers

An Armor-Flex installation two years old - no maintenance

This remarkable plastic marker is being rapidly adopted by traffic officials because they have tried it in their "tough" spots and it has sold itself. Markings placed ten years ago are still in service. It's the most for your "marking dollar" and takes the "headache" out of traffic marking.

Armor-Flex is easily and quickly installed with simple equipment which we supply. Applied to the pavement surface with special hot mastic. Traffic uses at once. It is self polishing and maintains very high visibility. Any desired size of markings can be supplied. Wide variety of pavement messages. Our agents supervise first installations.

Get our comparative marking costs—"Painting vs. Armor-Flex". Authentic data from the experience of leading traffic officials.

BE SURE TO CONSIDER ARMOR-FLEX FOR POST-WAR PROGRAMS

Representatives throughout the U. S., Canada and Great Britain
(Except in S. E. States, Maryland to Florida, where agents are wanted)

For Full Information Write

ARMOR-FLEX COMPANY
6993 Hillsland Ave. **St. Louis 9, Mo.**

toward the successful operations of the Fifth Army. . . . Be assured that the thoroughness with which you have done your job will have far reaching results in the successful conclusion of the Italian Campaign."

HAWLEY SIMPSON (Mem.), Research Engineer, American Transit Association and MERWYN KRAFT (Affil.), Secretary, Transit Manpower Committee, American Transit Association, are conducting an extensive transit accident survey for the City of Detroit.

STUART HAWLEY (Affil.), Traffic Engineer for the Texas Company, New York City, returned to his work in New York recently after spending several months in the Florida keys recuperating from an illness.

NEWS FROM HERE AND THERE

WARTIME DRIVER TEACHER'S MANUAL: The Traffic Engineering and Safety Department of the American Automobile Association has issued this comprehensive 192-page illustrated manual, designed to provide teachers with all material, outlines and supplementary data needed to present an effective Pre-Induction of Wartime Driver Education Course.

N.U.T.I. ANNOUNCES: The Northwestern University Traffic Institute has announced that applications are now being received from the nation's traffic policemen to attend its four-month traffic police administration course starting September 5, 1944. City, county, state and provincial police officers are eligible to compete for the fellowship and scholarship grants. The deadline for submitting applications is June 15.

THE WINNERS: Utah and Aberdeen, S. D., have been named grand prize winners in the National Safety Contest conducted by the National Safety Council. All 48 states and 1297 cities participated in the contest, which covers the calendar year of 1943. States which won first place in their divisions were Connecticut, Oklahoma, Minnesota, and Utah. Cities placing first in their population groups were Cleveland and Chicago, tied, Cincinnati, Wichita, Arlington, Va., Rochester, Minn., and Aberdeen, S. D.

Attention Consultants!

Occasionally the Institute of Traffic Engineers is asked for names of consultants.

In order to facilitate answering these requests, which will probably increase in the future, Institute Members and other qualified traffic and transportation engineers who are interested in doing consulting work are urged to submit their names to the Institute of Traffic Engineers headquarters, 60 John Street, New York 7, N. Y.

Accompanying would be a brief resumé of work experience and qualifications plus an indication of the specific field in which the consultant is best qualified.

It would be helpful to stipulate whether available for full time or part time work, and the approximate consulting fee.

I.T.E. MEMBERSHIP QUALIFICATIONS

From time to time inquiries have been received from prospective applicants and others relative to qualifications for membership in the Institute of Traffic Engineers. These are included in the following. Attention is called to the fact that the qualifications for Affiliate Membership are the newly revised standards adopted during the latter part of 1943.

PLAN TODAY

To Use GROTELITE

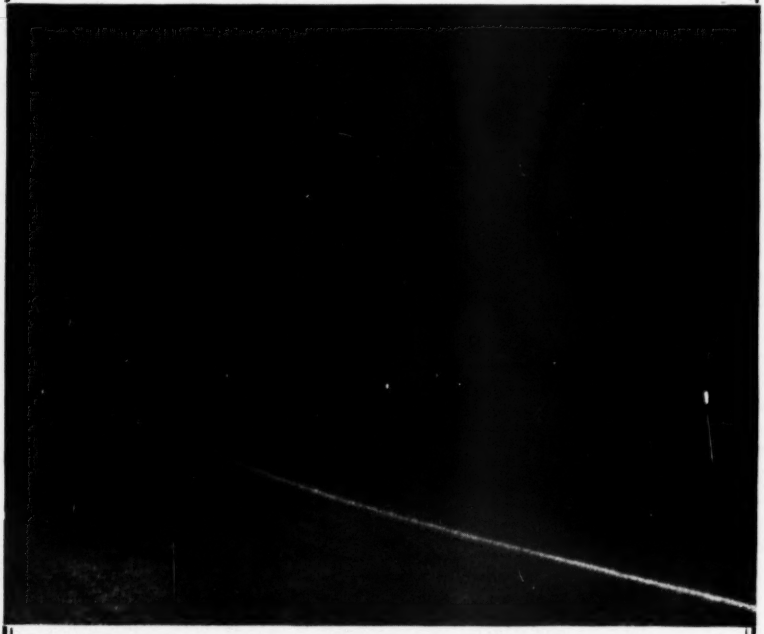
PLASTIC REFLECTORS ON TOMORROW'S HIGHWAYS

These sturdy roadside delineators are equipped with the new Grotelite plastic reflector.

They are prismatic type; front face is smooth.

High intensity reflection at long range. Extreme angularity without loss of reflecting power. They remain visible almost up to the point of passing by the vehicle. Housings are of rugged construction, durably finished.

BE SURE TO SPECIFY GROTELITE PLASTIC REFLECTORS FOR ECONOMY



The Grotelite Co., Inc.

Bellevue, Kentucky

Quoting from the Constitution and By-Laws:

ARTICLE II.

SECTION 1. The membership of the INSTITUTE shall consist of Members, Associate Members, Affiliates, Juniors, and Honorary Members. Members, Associate Members and Juniors shall be professionally engaged in the practice of traffic engineering.

ARTICLE I.

SECTION 1. A Member shall be not less than thirty (30) years of age and shall have been in the active practice of engineering for at least ten (10) years and shall have been in responsible charge of work in one of the recognized branches of engineering for at least five (5) years. For at least five (5) years he shall have been engaged in the practice of traffic engineering and for at least two (2) years of this period he shall have been in responsible charge, and shall be qualified to conceive, design and direct traffic engineering work.

SECTION 2. An Associate Member shall be not less than twenty-five (25) years of age and shall have been in the active practice of engineering for at least eight (8) years. For at least three (3) years, he shall have been engaged in the practice of traffic engineering and for at least one (1) year of this period he shall have been in responsible charge.

SECTION 3. An Affiliate, at the time of admission, shall be a person who is contributing substantially to the advancement of the Traffic Engineering profession through outstanding achievement in a related field, in which he shall have been engaged for at least ten (10) years, five (5) years of which he shall have been in responsible charge of important work. At no time shall an invitation to Affiliate Membership be extended if the number of Affiliate Members equals or exceeds 20 per cent of the total number of Members and Associate Members.

SECTION 4. A Junior shall be not less than twenty-one (21) years of age and shall have been in the active practice of engineering for at least five (5) years. For at least one (1) year he shall have been engaged in the practice of traffic engineering.

SECTION 5. The membership of a Junior in the INSTITUTE shall cease when he becomes thirty-five (35) years of age unless he be previously transferred to the grade of Associate Member.

SECTION 6. An Honorary Member shall be a person who has performed notable and outstanding services in the interest of the profession of traffic engineering. At no time shall there be more than five (5) Honorary Members.

SECTION 7. In considering the qualifications of candidates for the grade of Member, Associate Member, and Junior, graduation in engineering from a school of recognized standing shall be equivalent to four (4) years of active practice in engineering, and the satisfactory completion of each year of work in an engineering school of recognized standing without graduation, shall be equivalent to one-half (½) year of active practice. Graduation in a course other than engineering from a college or university of recognized standing shall be considered equivalent to two (2) years of active practice. Full-time post-graduate work in engineering in a school of recognized standing shall be equivalent to an equal time in active practice, and part-time post-graduate work shall be given appropriate credit. Provided, however, that no candidate shall receive credit for more than four (4) years of active practice in engineering because of educational qualifications.

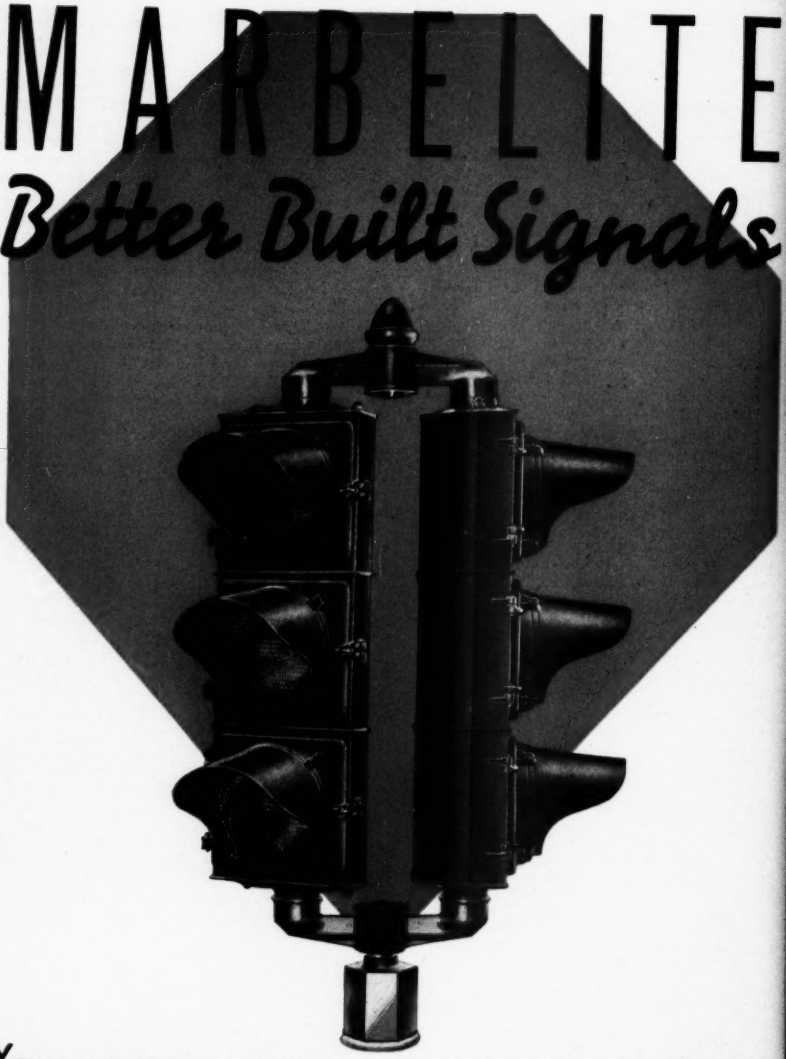
SECTION 8. An applicant for the grade of Member who submits more than ten (10) years of engineering experience but who is deficient in traffic engineering experience shall be permitted to substitute such additional engineering experience, provided it is of professional grade, in lieu of traffic engineering experience, two (2)) years of such additional experience being considered equivalent to one (1) year of traffic engineering experience, provided, however, that there must be offered not less than three (3) years of traffic engineering experience of which at least two (2) years must be in responsible charge. An applicant for the grade of Associate Member, who submits more than eight (8) years of engineering experience, but who is deficient in traffic engineering experience shall be permitted to substitute such additional engineering experience, provided it is of professional grade, in lieu of traffic engineering experience; two (2) years of such additional engineering experience being considered equivalent to one (1) year of traffic engineering experience, provided, however, that there must be offered at least two (2) years of traffic engineering experience, of which at least one (1) year must be in responsible charge.

SECTION 9. Engineering work of professional grade, which may be substituted for a portion of the experience in traffic engineering, as provided in Sec. 8 of this article, shall include experience in engineering after the applicant is twenty-one (21) years old, during which he has been engaged in engineering work of a higher grade than that of draftsman, instrument man and inspector, or in similar grades in which the applicant is working under direct supervision, or in positions where the personal responsibility and technical knowledge required are small.

SECTION 10. Membership in one of the Founder Engineering Societies shall be accepted as proof of the necessary engineering experience, other than traffic engineering experience, required for admission to the equivalent grade in the INSTITUTE.

MARBELITE

Better Built Signals



YOU can determine by just looking at this advanced design of a Two Way, Three-Color adjustable Signal that it is BETTER-BUILT.

Note the reinforced aluminum mounting brackets that replace the conventional pipe and fitting assembly. A compact, sturdy arrangement, eliminating small, minor parts.

You bet! It is BETTER-BUILT quality.

That isn't all, but it gives an idea of why Marbelite Signals are approved by numerous State and City Traffic Departments as well as Traffic Associations, and why there are so many thousands of Marbelite Signals in use in these Cities and States.

Familiarize yourself with other Marbelite features, such as the unbeatable optical unit. You will be proud to have such fine quality Signals regulating traffic in your community.

THE MARBELITE COMPANY, INC.

26 WARREN STREET **NEW YORK 7, N. Y.**